Claims 11-15 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Terasaki (U.S. Patent No. 5,999,532) in view of Greaves et al. (U.S. Patent No. 6,396,815 B1), and further in view of Mendelson et al. (U.S. Patent No. 6,343,083 B1)

Claims 2-4 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Terasaki (U.S. Patent No. 5,999,532) in view of Greaves et al. (U.S. Patent No. 6,396,815 B1), and further in view of Hijikata et al. (U.S. Patent No. 5,864,537).

The Applicants traverse the rejections and request reconsideration.

In making the rejections, the Examiner appears to be construing the term call control function over broadly. The following explanation is provided to further clarify that the term "call control function" is nothing more than that defined in the standard ATM protocol.

In an ATM switching apparatus (ATM network) - that includes an ATM subscriber line concentrator - network terminator - subscriber terminal, conventionally, a call control function is needed. Such a call control function depends on the ATM standards in which all of the ATM switching apparatus (ATM Network) up to the subscriber terminal are defined. For this reason, it is necessary that the call control function conforms to the ATM standards in which all of the ATM switching apparatus (ATM network) up to the subscriber terminal are defined. Since the call control function had to be consistent with the ATM standards, the flexibility and independence of the network terminator and the subscriber terminal are compromised. This also drive up the cost of the equipment. Also, it is necessary to change the design of the network terminator and the subscriber terminal every time the standards used in the network are changed.

The present invention makes it possible to configure the system by defining only the UNI between the ATM switching apparatus (ATM network) and the ATM subscriber line concentrator based on the unified ATM standards. The rest of the call control between the ATM subscriber line concentrator and the network terminator (between the ATM subscriber line concentrator and the network terminator and between the network terminator and the subscriber terminal) are based on a protocol of optional standards.

In an exemplary non-limiting embodiment of the present invention the following features are provided in the configuration:

(1) The ATM subscriber line concentrator uses a substitute call control function instead of the call control function based on and defined by the ATM standards.

(2) In the substitute call control function, a call is processed between the ATM switching apparatus (ATM network) and the ATM subscriber line concentrator based on the UNI protocol of the unified ATM standards. However, the processing between the ATM subscriber line concentrator and the subscriber terminal (between the ATM subscriber line concentrator and the network terminator and between the network terminator and the subscriber terminal) are based on a protocol of optional standards different from ATM standards.

Figure 3 shows a first example. Fig. 3 is a format diagram showing the protocol used when a substitute call control message which is sent and received between the substitute call control function and the network terminator and the subscriber terminals, is mapped on a TCP/UDP layer.

That is, in UNI between the ATM switching apparatus of the ATM network and the ATM subscriber line concentrator of the ATM subscriber network, an SDH layer, an ATM layer, an AAL5 layer, an SSCOP layer, an SSC F-layer, and a signaling layer are provided based on the standard call control protocol, thereby controlling the call between the ATM switching apparatus application and the ATM subscriber line concentrator application. This means that the process is on the basis of standard protocol.

On the other hand, the ATM subscriber line concentrator application and the network terminator application includes the substitute call control function. This has, for example, the SDH/xSDL layer, the AT layer, the AAL5 layer, IEEE802.2 LLC/SNAP layer, the IP layer , and the TPC/UPD layer, as the substitute call control protocol.

When the SDH layer is provided, an IPOA communication system is adopted, and when the xDSL layer is provide an xDSL over ATM communication system is adopted.

The network terminator application and the subscriber terminal application have IEEE 802.3 an Ether layer, an IEEE 802.5 MAC (Media access Control) layer, an IP layer, and an TPC/UDP layer as the substitute call control protocol and the substitute call control message is sent and received.

Figure 4 shows another exemplary, non-limiting embodiment. Fig. 4 shows a format diagram showing the protocol used when the substitute call message which is sent and received between the substitute call control function and the network terminator.

In the UNI between the ATM switching apparatus and the ATM subscriber line concentrator, the SDH layer, the TM layer, the AAL5 layer, the SSCOP layer, the SSCF layer,

and he signaling layer are provided as part of the call control protocol. This is based on the standard protocol.

The ATM subscriber line concentrator application and the network terminator application for the substitute call control function are composed of the SDH/xDSL layer, the ATM layer, and the AAL layer as the substitute call control protocol and the substitute call message are sent and received.

When the xDSL layer is provided, the xDSL over ATM communication system is adopted. The network terminator application and the subscriber terminal application have the SDH layer, the ATM layer, the AAL5 layer as the substitute call control protocol and the substitute call control message is sent and received.

(3) The substitute call control function achieves continuity of call control between different protocols (the ATM switching apparatus ↔ subscriber terminal) through mutual protocol conversion.

For the substitute call control function in the ATM network, the substitute call control function of the TM subscriber line concentrator application, and a form of the substitute call control message sent and received between the network terminator application and the subscriber terminal application are determined.

The substitute call control message is mapped onto the TCP/UDP layer shown in Fig. 3 and the substitute call control message is mapped onto an ATM cell shown in Fig. 4. A line number and the ATM address of the subscriber terminal are set in a management table held by the substitute call control function of the ATM subscriber line concentrator.

Fig. 5 is a block diagram showing the configuration of a logical channel of the ATM subscriber network when the protocol shown in Fig. 3 is used for the substitute call control system in the ATM subscriber network of the present invention.

A call control procedure is carried out between the ATM switching apparatus and the ATM subscriber line concentrator through the call control channel 210a (VPI/VCI=O/5) as a PVC connection, to control establishment/release of SVC connection 200b between the ATM switching apparatus and the ATM subscriber line concentrator.

A predetermined substitute call control procedure is carried out between the ATM subscriber line concentrator and the network terminator by using the call control channel 210b (VPI/VCI=O/5) (the values of VPI/VCI are same as those of the channel 210a) as a PVO connection to control establishment/release of a SVC connection 200b between the ATM subscriber line concentrator and the network terminator.

The network terminator and the subscriber terminal are connected by ether and a predetermined substitute call control procedure is carried out to control establishment/release of a connection corresponding t SVC connection 200b between the AT switching apparatus and the ATM subscriber line concentrator and between the ATM subscriber line concentrator and the network terminator.

Fig. 6 is a block diagram showing the configuration of the logical channel of the ATM subscriber network where the protocol shown in Fig. 4 is used.

The call control procedure is carried out between the ATM switching apparatus and the ATM subscriber line concentrator through the call control channel 210a (VPI/VCI=O/5) as a

PVC connection, to control the establishment/release of the SVC connection 200a between the ATM switching apparatus and the ATM subscriber line concentrator.

Using the call control channel 210b (VPI/VCI= /5) (the values of VPI/VCI are same as those of the channel 210a) as the PVC connection between the ATM subscriber line concentrator and the network terminator, a predetermined substitute call control procedure is carried out to control the establishment/release of the SVC connection 200b the ATM subscriber line concentrator and network terminator.

Also, using the call control channel 210c (VPI/VCI=O/5) (the values of VPI/VCI are same as those of the channel 210a) as the PVC connection between the network terminator and the subscriber terminal, a predetermined substitute call control procedure is carried out to control the establishment/release of the SVC connection 200c the network terminator and the subscriber terminal.

(4) The substitute call control function manages the following data to have a relationship by using a management table to maintain continuity of the call control in the above-mentioned optional protocols:

A number of a line connected with the subscriber terminal which is accommodated in the ATM subscriber line concentrator.

An ATM address of the subscriber terminal.

A call number allocated when call control message is sent and received between the ATM switching apparatus and substitute call control function instead of the subscriber terminal.

The VPI and VCI allocated to the substitute call control function instead of the subscriber terminal between the ATM switching apparatus and the ATM subscriber line concentrator.

An explanation of the establishment of the SVC connection is provided below.

The ATM switching apparatus application and the ATM subscriber line concentrator application executes the call control procedure through the call control channel 210a (VPI/VCI=0/5) to establish the SVC connection VPI/VCI (200a) between the ATM switching apparatus and the ATM subscriber line concentrator. In other words, this step is based on the ATM standards.

In the SVC connection 200b and 200c a predetermined substitute call message is used. This is notified to the network terminator application of the network terminator and the subscriber terminal application of the subscriber terminal through the PVC connection and 210b and 210c (VPI/VCI=0/5) using the predetermined substitute call control procedure. Thus, the VPI/VCI=X/Y values of the SVC connections 200b and 200c are set.

A call number when the call control procedure is executed at the ATM switching apparatus is stored in the call number column 303 of the management table of the substitute call control function. The value X of VPI and the value Y of VCI of the SVC connection 200a established between the ATM switching apparatus and the ATM subscriber line concentrator are set in the VPI column 304 and the VCI column 305 management table and the management table is updated.

An explanation of the release of the SVC connection is provided below.

The ATM switching apparatus application and the ATM subscriber line concentrator application execute the call control procedure between the ATM switching apparatus the ATM subscriber line concentrator and releases the connection VPI/VCI=X/Y (200a).

The SVC connection 200a (VPI/VCI=X/Y) between switching apparatus and the ATM subscriber line concentrator is released by the standard call control procedure using the call control channel 210a (VPI/VCI=0/5). At this time, with the SVC connections 200b and 200c between the ATM subscriber line concentrator and the network terminator and between the terminator and the subscriber terminal, the VPI value X and VCI value Y of the released SVC connection 200a are set to a predetermined substitute call control message. This is notified to the network terminator application of the terminator and the subscriber terminal application of subscriber terminal through the PVC connection 210b and 210c (VPI/VCI=0/5) using the predetermined substitute call procedure. Thus, the VPI/VCI=X/Y values of the SVC connection 200b and 200c are released.

With the release of the SVC connections 200b and 200c, the contents of the management table are updated. That is, the call number 303 of the released SVC connection 200a when the call control procedure is carried out to the ATM switching apparatus is deleted. Also, data of the columns VPI 304 and VCI 305 in the same row as this call number are deleted.

The present invention provides the following advantages:

(a) The existing protocol is used for the communication system among the subscriber terminal, the network terminator and the substitute call function. The use of the substitute call control function can be made possible only by defining the substitute call control procedure and the format of the substitute call control message.

(b) It is sufficient to install a simple exclusive use driver for the substitute call control function procedure in the ATM subscriber line concentrator and the subscriber terminal in order to map the substitute call control message on the TPC/IP communication or the UDP/IP communication.

Therefore, the subscriber terminal in which an adapter for the Ether network is installed can easily use the SVC connection of the ATM network.

Terasaki aims to improve a transmission path efficiency in the subscriber network of ATM switching apparatus 1 by providing a line concentration stage 2. For this purpose, an ATM switch 19 and a signaling termination circuit 20 are provided for the line concentration stage 2.

However, a call control from a subscriber terminal to an ATM switching apparatus is carried out based on the protocol defined by the ATM standards, as shown in the signaling chart of Fig. 5 and described in column 7, lines 53 to 56.

The Examiner appears to incorrectly contend that the signaling termination circuit 20 in Terasaki is similar to the substitute call control function of the present invention. However, the processes of this signaling termination circuit 20 are as follows:

(1) receiving a call process instruction from a subscriber terminal 5, executing a signaling process with the subscriber terminal 5 and a signaling process with an ATM switching apparatus 1, and establishing an SVC between the ATM witching apparatus 1 and the line concentration stage 2, an SVC between line concentration stage 2 and subscriber terminal 5; and

(2) connecting those SVCs through ATM switch 19 and establishing a SVC path from the subscriber terminal 5 to the ATM switching apparatus 1.

That is, these processes are carried out based on the protocol defined by the ATM standards on either side.

The line concentration stage 2 is provided to improve the use efficiency of the transmission path 9 by connecting only a subscriber terminal line with the ATM switching

apparatus 1 by using the ATM switch 19. For this purpose, the signaling termination circuit 20 which terminates mutual signaling is needed to specify the paths on the input and output sides. As a result, the flexibility of the ATM switching apparatus 1 and the subscriber terminal 5 is allegedly improved through the call process on the side of the ATM switching apparatus and the call process on the side of subscriber terminal 5. However, Terasaka does not teach the present invention in which the difference between protocols is absorbed or eliminated by the substitute call control function.

Greaves aims to provide a technique of controlling a subnetwork using a cheap and simple ATM apparatus and external computer means using a switch when multimedia service is introduced into the subnetwork like a home area network. Such a subnetwork is a topology where a plurality of simple switches 130 are arranged in a mesh and an end station 140 is connected to each switch 130. The subnetwork is connected with the standard ATM network through the external computer means 110. A Proxy 113 controls the switch 130 in the mesh structure, and a Proxy Controller 114 manages the end station. A Proxy signaling agent 118 processes a call connection request from the end station.

The Proxy agent is not a substitute call control function of the present invention. There is no teaching in Greaves to suggest that the Proxy agent can be used to perform the functions of a substitute call control as in the present invention. It does not teach a call process when the end station is connected with the standard ATM network.

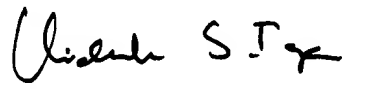
A skilled artisan would not have been able to practice the present invention from the combined teachings of Teresaki and Greaves.

Claims 2-17 are dependant on claim 1, and therefore, the arguments presented above are equally valid. Further, the secondary references Mendelson and Hijikata do not overcome the deficiencies noted above in the teachings of Teresaki and Greaves.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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